IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Jeff EDER

Serial No.: 09/764,068

Filed: January 19, 2001

For: A method of and system for defining and measuring the real options of a commercial enterprise

Group Art Unit: 3628

Examiner: C. Graham

Brief on Appeal

Commissioner of Patents and Trademarks

Washington, D.C. 20321

Sir or Madam:

The Table of Contents is on page 2 of this paper.

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Real party in interest

Asset Reliance, Inc. (dba Asset Trust, Inc.)

*

Related appeals

An appeal for U.S. Patent Application 10/012,374 filed December 12, 2001 may be affected by or have a bearing on this appeal. An appeal for U.S. Patent Application 10/329,172 filed December 23, 2002 may be affected by or have a bearing on this appeal. An appeal for U.S. Patent Application 09/761,671 filed January 18, 2001 may be affected or have a bearing on this appeal. An Appeal for U.S. Patent Application 09/940,450 filed on August 29, 2001 may be affected by or have a bearing on this appeal. An Appeal for U.S. Patent Application 09/688,983 filed on October 17, 2000 may be affected by or have a bearing on this appeal.

Status of Claims

Claims 36 - 65 and 67 – 71 are rejected and are the subject of this appeal. Claims 36, 46 and 54 are amended. Claims 1 – 35 and 66 were previously cancelled without prejudice. Claims 72 - 74 are new.

Status of Amendments

An Amendment/Reply after a Non-Final Rejection was submitted on October 11, 2006.

Summary of Claimed Subject Matter

One embodiment of a detailed method of and system for defining and measuring the real options of a commercial enterprise according to the present invention is best depicted in Figures 1 – 7 of the specification for the instant application. Figure 1 gives an overview of the major processing steps which include aggregating, converting and integrating data from a plurality of database management systems for use in analysis, analyzing the data as required to develop a model of enterprise market value by element and category of value, analyze changes and produce reports.

One embodiment of the system for defining and measuring the real options of a commercial enterprise is exemplified in independent claim 36 where an enterprise method integrates data from a plurality of management systems for use in analysis and analyzes the data using a series of multivariate analyses in order to identify a tangible impact of each element of value and develop a model of enterprise market value by element and category of value. More specifically, data from the database management systems associated with a plurality of enterprise transaction systems are prepared for use in processing by integrating, converting and storing the data in accordance with a common schema as described in FIG. 1, reference number 200, FIG. 5A reference numbers 201 - 204, 207 – 209 and 211 FIG. 5B reference numbers 221 – 222, 225 – 226, 209 and 211, FIG. 5C reference numbers 241 – 242, 245 – 246, 209 and 211, FIG. 5D reference numbers 261 – 262, 265, 267, 269, 209 and 211, FIG. 5E reference numbers 268 – 269, 272, 278 - 279 and 281 - 282, FIG. 5F reference numbers 291 - 298,and line 1, page 14 through line 18, page 47 of the specification. The integrated data are then analyzed using a series of multivariate analyses in order to develop a model of enterprise market value that identifies a tangible impact of each element of value on each category of value in accordance with the procedure detailed in FIG. 1, reference number 300, FIG. 6A reference number 302 - 312, FIG. 6B reference numbers 321, 323 and 325 - 332, FIG. 6C reference numbers 341 - 343, 345, 347 and 351 - 353 and line 20, page 47 through line 30, page 75 of the specification.

A second embodiment of the system for defining and measuring the real options of a commercial enterprise is exemplified in independent claim 46 where a program storage device integrates data from a plurality of management systems for use in analysis in accordance with a common schema and analyzes the data in order to identify indicators by element of value. The indicators are then analyzed using series of predictive models in order to identify a tangible impact of each element of value, develop a model of enterprise market value by element and category of value, calculate a value for each element of value and report the calculated value. More specifically, data from the database management systems associated with a plurality of enterprise transaction systems are prepared for use in processing by integrating, converting and storing the data in accordance with a common schema as described in FIG. 1, reference number 200, FIG. 5A reference numbers 201 - 204, 207 – 209 and 211 FIG. 5B reference numbers 221 – 222, 225 – 226, 209 and 211, FIG. 5C reference numbers 241 – 242, 245 – 246, 209 and 211, FIG. 5D reference numbers 261 – 262, 265, 267, 269, 209 and 211, FIG. 5E reference numbers 268 – 269, 272, 278 - 279 and 281 - 282, FIG. 5F reference numbers 291 - 298,and line 1, page 14 through line 18, page 47 of the specification. The integrated data are then analyzed in order to identify indicators, develop a model of enterprise market value that identifies a tangible impact of each element of value on each category of value using said indicators and determine the value of each element of value in accordance with the procedure detailed in FIG. 1, reference number 300, FIG. 6A reference number 302 - 312, FIG. 6B reference numbers 321, 323 and 325 - 332, FIG. 6C reference numbers 341 - 343, 345, 347

and 351 - 353 and line 20, page 47 through line 30, page 75 of the specification. The value of each element of value is then reported in accordance with the procedure detailed in FIG. 1 reference number 400, FIG. 7 reference numbers 402 – 407 and line 33, page 75 through line 30, page 77 of the specification.

A third embodiment of the system for defining and measuring the real options of a commercial enterprise is exemplified in independent claim 55 where a program storage device integrates data from a plurality of management systems for use in analysis in accordance with a common schema and analyzes the data in order to identify indicators by element of value. The indicators are then analyzed using series of predictive models in order to identify a tangible impact of each element of value, develop a causal model of enterprise market value by element and category of value. More specifically, data from the database management systems associated with a plurality of enterprise transaction systems are prepared for use in processing by integrating, converting and storing the data in accordance with a common schema as described in FIG. 1, reference number 200, FIG. 5A reference numbers 201 - 204, 207 – 209 and 211 FIG. 5B reference numbers 221 – 222, 225 – 226, 209 and 211, FIG. 5C reference numbers 241 – 242, 245 – 246, 209 and 211, FIG. 5D reference numbers 261 – 262, 265, 267, 269, 209 and 211, FIG. 5E reference numbers 268 – 269, 272, 278 - 279 and 281 - 282, FIG. 5F reference numbers 291 - 298,and line 1, page 14 through line 18, page 47 of the specification. The integrated data are then analyzed using a series of multivariate analyses in order to develop a causal model of enterprise market value that identifies a tangible impact of each element of value on each category of value in accordance with the procedure detailed in FIG. 1, reference number 300, FIG. 6A reference number 302 - 312, FIG. 6B reference numbers 321, 323 and 325 - 332, FIG. 6C reference numbers 341 - 343, 345, 347 and 351 - 353 and line 20, page 47 through line 30, page 75 of the specification. The market value model is then optimized using the method described in FIG. 5B reference number 615 and column 68, lines 1 - 12 of cross-referenced U.S. Patent 5,615,109.

A fourth embodiment of the system for defining and measuring the real options of a commercial enterprise is exemplified in independent claim 64 where a method uses independent components of application software to process data that has been integrated from a plurality of management systems in accordance with a common xml schema in order to produce useful results. More specifically, data from the database management systems associated with a plurality of enterprise transaction systems are prepared for use in processing by integrating, converting and storing the data in accordance with a common xml schema as described in FIG. 1, reference number 200, FIG. 5A reference numbers 201 - 204, 207 – 209 and 211 FIG. 5B reference numbers 221 – 222, 225 – 226, 209 and 211, FIG. 5C reference numbers 241 – 242, 245 – 246, 209 and 211, FIG. 5D reference numbers 261 – 262, 265, 267, 269, 209 and 211, FIG. 5E reference numbers 268 – 269, 272, 278 - 279 and 281 - 282, FIG. 5F reference numbers 291 - 298,and line 1, page 14 through line 18, page 47 of the specification. The integrated data are then analyzed using a series of independent software components in order to produce useful results as detailed in FIG. 1, reference number 300, FIG. 6A reference number 302 - 312, FIG. 6B reference numbers 321, 323 and 325 - 332, FIG. 6C reference numbers 341 - 343, 345, 347 and 351 - 353 and line 20, page 47 through line 30, page 75 of the specification.

A fifth embodiment of the system for defining and measuring the real options of a commercial enterprise is exemplified in independent claim 70 where a program storage device integrates converts and stores data from a plurality of management systems for use in analysis in accordance with a common xml schema. More specifically, data from the database management systems associated with a plurality of enterprise transaction systems are prepared

for use in processing by integrating, converting and storing the data in accordance with a common xml schema as described in FIG. 1, reference number 200, FIG. 5A reference numbers 201 - 204, 207 – 209 and 211 FIG. 5B reference numbers 221 – 222, 225 – 226, 209 and 211, FIG. 5C reference numbers 241 – 242, 245 – 246, 209 and 211, FIG. 5D reference numbers 261 – 262, 265, 267, 269, 209 and 211, FIG. 5E reference numbers 268 – 269, 272, 278 - 279 and 281 - 282, FIG. 5F reference numbers 291 - 298,and line 1, page 14 through line 18, page 47 of the specification.

Grounds of rejection to be reviewed on appeal

Issue 1 - Whether claims 36 - 45 are patentable under 35 USC 103 over Marshall (US Patent 6,073,115) in view of Krishnaswamy (U.S. Patent 6,909,708)?

Issue 2 - Whether claims 46 - 54 are patentable under 35 USC 103 over Marshall in view of Krishnaswamy?

Issue 3 - Whether claims 55 - 63 are patentable under 35 USC 103 over Marshall in view of Krishnaswamy?

Issue 4 - Whether claims 64, 65 and 67 - 69 are patentable under 35 USC 103 over Marshall in view of Krishnaswamy?

Issue 5 - Whether claims 70 - 71 are patentable under 35 USC 103 over Marshall in view of Krishnaswamy?

The Argument

For each ground of rejection which Appellant contests herein which applies to more than one claim, such additional claims, to the extent separately identified and argued below, do not stand and fall together.

Issue 1 - Whether claims 36 – 45 are patentable under 35 USC 103 over Marshall (US Patent 6,073,115) in view of Krishnaswamy (U.S. Patent 6,909,708)?

The claims are patentable because the cited combination of documents used to support the rejection of claims 36 – 45 fails to establish a prima facie case of obviousness. Reasons the cited combination fails to establish a prima facie case of obviousness include:

1. the cited combination of documents teach away from the proposed combination;
2. the cited combination of documents fails to make the invention as a whole obvious,
3. the cited combination fails to meet any of the criteria for establishing a prima facie case of obviousness, and
4. the cited combination requires a change in the principles governing the operation of one or more of the methods disclosed in the documents.

The first reason that claims 36 – 45 are patentable is that the cited combination of documents teach away from their own combination. MPEP § 2145 X.D.2 provides that: "it is improper to combine references where the references teach away from their combination." The Marshall and Krishnaswamy documents teach away from the proposed theoretical combination in a number of ways, including:

1. Incompatible system topologies. Marshall teaches the use of Dynamic Data Exchange (hereinafter, DDE) for obtaining data from other systems (Marshal C5, L50 - 60 and C11, L20 - 25). It is well known to those of average skill in the art that DDE is a mechanism for linking two applications on the same computer together in order to exchange data (see Visual Automation) At the same time, Krishnaswamy teaches distributed data management (Krishnaswamy, C38, L47 - C39, L 68). More specifically, Krishnaswamy teaches that "data is stored at many locations simultaneously" using distributed databases (Krishnaswamy, C39, L 5 - 6). It clearly would be improper to combine an invention that teaches and relies on the data being present on a single computer with a system that teaches and relies on data being stored in distributed databases resident on many computers.
2. Incompatible data management. Marshall teaches the use of DDE (Marshal C5, L50 - 60 and C11, L20 - 25). It is well known to those of average skill in the art that DDE is a method for obtaining data on an item at a time basis usually by spreadsheet cell (see Visual Automation). At the same time Krishnaswamy teaches the use of distributed data storage which includes automated replication and synchronization in accordance with a common schema (Krishnasway, C39 L14 - 19). It clearly would be improper to combine an invention that teaches and relies on obtaining data one item at a time basis with an invention that teaches and relies on database level replication and synchronization.
3. Incompatible focus. Marshall teaches a virtual reality generator for abstract pheonomena (Marshall, Title). Marshall goes on to state that "the information displayed in (the) virtual reality world created by the present invention is abstract information about the real world that does not have a physical object equivalent in the real world (Marshall, Column 3, lines 49 – 54). At the same time, a primary

use of the Krishnaswamy invention is "routing telephone calls, data and other multimedia information including video, audio and data." (Krishnaswamy, Abstract). The information routed by Krishnaswamy are physical objects that exist in the real world. It clearly would be improper to combine an invention that teaches the display of abstract information that does not have a physical object equivalent in the real world with a system for managing real world data and information.

The second reason claims 36 – 45 are patentable is that the cited combination of documents fails to make the invention as a whole obvious as required by MPEP § 2141.02 which states that: "in determining the difference between the prior art and the claims, the question under 35 U.S.C. 103 is not whether the differences themselves would have been obvious but whether the claimed invention as a whole would have been obvious." As noted previously, the obviousness rejections are based on a combination of Marshall and Krishnaswamy. Each of the documents:

1. teach away from the claimed method in a number of ways, and
2. teach away from the proposed combination as described previously.

Taken together the cited combination of documents fails to make the invention as a whole obvious. The cited combination also fails to make a single aspect of the claimed invention obvious. These failures provide additional evidence that the claimed invention for producing, concrete, tangible and useful results is new, novel and non-obvious.

The third reason claims 36 - 45 are patentable is that the cited combination fails to meet any of the criteria required for establishing a prima facie case of obviousness. MPEP 2142 provides that: in order to establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation to modify the reference or combine the reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The 24 July 2006 Office Action fails to meet all three criteria for establishing a prima facie case of obviousness as detailed below:

1. The cited combination of documents fails to meet the first criteria for establishing a prima facie case of obviousness for claims 36 - 45 because it does not provide any evidence that there was any suggestion, teaching or motivation (including scientific reasoning) in the prior art to modify or combine the teachings of Marshall and/or Krishnaswamy. In fact the opposite is true as there is an incentive not to complete the theoretical combination of Krishnaswamy and Marshall. It is well established that "teachings of references can be combined only if there is some suggestion or incentive to do so" quoting ACS Hosp. Sys., Inc. v Montefiore Hosp., 732 F.2d 1572, 1577 221 U.S.PQ 929,933 (Fed. Cir. 1984). Reasons for not completing the proposed theoretical combination include: the two documents teach incompatible data management methods and system topologies.
2. The cited combination also fails to meet the second criteria for establishing a prima facie case of obviousness for claims 36 - 45 because it does not cite a combination of documents that has a reasonable expectation of success. There are several reasons why the cited combination of documents (Marshall and Krishnaswamy) does not have a reasonable expectation of success. These reasons include:
    a. the two documents teach incompatible methods for data management;
    b. the proposed combination would destroy the ability of the Marshall invention to function, and

c. the Examiner has been unable to explain how the combination would be completed or why it was suggested in the first place. It is well established that "particular findings must be made as to the reason the skilled artisan, with no knowledge of the claimed invention, would have selected these components for combination in the manner claimed" (In re Kotzab, 217 F.3d 1365, 1371, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000)). In spite of this well know requirement, the Office Action has not described how the teachings of these references would be combined or the reason for doing so.

3. The cited combination fails to meet the third criteria because it does not teach or suggest one or more of the claim limitations for every rejected claim.

The fourth reason that claims 36 - 45 are patentable is that the proposed combination of documents would change one or more of the principles of operation of the Marshall and Krishnaswamy methods. MPEP 2143.01 provides that when "the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious. In re Ratti, 270 F.2d 810, 123 USPQ 349 (CCPA 1959)". As noted previously, the obviousness rejections are based on a combination of Marshall and Krishnaswamy. Some of the changes in the operating principles of the cited documents that would be required to make the combination function are discussed below.

1. Change from visualization of abstract phenomena to analysis of real world elements of value. Marshall teaches a virtual reality generator for abstract pheonomena (Marshall, Title). Marshall goes on to state that "the information displayed in (the) virtual reality world created by the present invention is abstract information about the real world that does not have a physical object equivalent in the real world (Marshall, Column 3, lines 49 – 54). The Examiner has proposed using this invention in combination with Krishnaswamy to among other things render obvious an invention for identifying a tangible, real world impact of a plurality of real world elements of value including brands, customers and employees. Modifying Marshall to evaluate or analyze real world elements of value would require a change in principle in the operation of the Marshall invention. As a result, the teachings of the cited combination of documents are not sufficient to render the claims prima facie obvious.
2. Change from distributed data storage to centralized data storage. Krishnaswamy teaches distributed data management (Krishnaswamy, C38, L47 - C39, L 68). More specifically, Krishnaswamy teaches that "data is stored at many locations simultaneously" using distributed databases (Krishnaswamy, C39, L 5 - 6). The Examiner has proposed using this invention in combination with Marshall to among other things render obvious an invention for integrating data from a plurality of systems in accordance with a common xml schema and storing the integrated in a single application database. Modifying Krishnaswamy to rely on a single, centralized database would require a change in principle in the operation of the Krishnaswamy invention. As a result, the teachings of the cited combination of documents are not sufficient to render the claims prima facie obvious.
3. Change from linked applications to independent software components. Marshall teaches the use of Dynamic Data Exchange (hereinafter, DDE) for obtaining data from other systems (Marshal C5, L50 - 60 and C11, L20 - 25). It is well known to those of average skill in the art that DDE is a mechanism for linking two applications on the same computer together in order to exchange data (see Visual Automation). The Examiner has proposed using this invention in combination with Krishnaswamy to among other things render obvious an invention for using independent components for producing tangible, concrete and useful results. Modifying Marshall to use independent

components instead of linked applications would require a change in principle in the operation of the Marshall invention. As a result, the teachings of the cited combination of documents are not sufficient to render the claims prima facie obvious.

The fifth reason that claims 36 - 45 are patentable is that the claimed invention produces results that are concrete, tangible and useful. In view of the previously documented shortcomings in the cited combination of documents that were used as the basis of the claim rejection, it also clear that the claims describe an invention that is novel, surprising, new and non-obvious. Furthermore, the claimed invention produces results that help satisfy a long felt need for enhanced capabilities for analyzing data, leveraging software investments and managing financial performance at an enterprise level.

Issue 2 - Whether claims 46 - 54 are patentable under 35 USC 103 over Marshall in view of Krishnaswamy?

The claims are patentable in view of the shortcomings in the arguments used to support the rejection of the claims and the usefulness of the results produced by the claimed invention. In particular, claims 46 - 54 are allowable for the first, second, third, fourth and fifth reasons advanced under Issue 1.

Issue 3 - Whether claims 55 - 63 are patentable under 35 USC 103 over Marshall in view of Krishnaswamy?

The claims are patentable in view of the shortcomings in the arguments used to support the rejection of the claims and the usefulness of the results produced by the claimed invention. In particular, claims 55 - 63 are allowable for the first, second, third, fourth and fifth reasons advanced under Issue 1.

Issue 4 - Whether claims 64, 65 and 67 - 69 are patentable under 35 USC 103 over Marshall in view of Krishnaswamy?

The claims are patentable in view of the shortcomings in the arguments used to support the rejection of the claims and the usefulness of the results produced by the claimed invention. In particular, claims 64, 65 and 67 - 69 are allowable for the first, second, third, fourth and fifth reasons advanced under Issue 1.

Issue 5 - Whether claims 70 - 71 are patentable under 35 USC 103 over Marshall in view of Krishnaswamy?

The claims are patentable in view of the shortcomings in the arguments used to support the rejection of the claims and the usefulness of the results produced by the claimed invention. In particular, claims 70 - 71 are allowable for the first, second, third, fourth and fifth reasons advanced under Issue 1.

Conclusion

For the extensive reasons advanced above, Appellant respectfully but forcefully contends that each claim is patentable. Therefore, reversal of all rejections is courteously solicited.

Respectfully submitted,

B.J. Bennett, President
Asset Reliance, Inc.
Dated: October 21, 2006

CLAIMS APPENDIX

36. An enterprise method, comprising:

preparing transaction data related to a commercial enterprise for use in processing, and

developing a model of enterprise market value by element and category of value by completing a series of multivariate analyses that utilize at least a portion of said data

where the categories of value are selected from the group consisting of current operation, real option, market sentiment and combinations thereof,

where the model of enterprise market value identifies a tangible contribution of each element of value to each category of value, and

where the elements of value are selected from the group consisting of alliances, brands, channels, customers, customer relationships, employees, intellectual property, partnerships, processes, vendors and vendor relationships and combinations thereof.

37. The method of claim 36 that further comprises completing activities selected from the group consisting of: determining an element contribution, quantifying an element impact, valuing an element, completing an analysis of enterprise financial performance, optimizing one or more aspects of enterprise financial performance, simulating an enterprise financial performance, optimizing a future enterprise market value, quantifying a future enterprise market value, creating a management report, valuing an enterprise market sentiment, calculating a real option discount rate, valuing a real option, valuing a share of enterprise stock, determining a target share price and combinations thereof.

38. The method of claim 37 where a financial performance optimization further comprises identifying one or more value driver changes that will optimize of one or more aspects of financial performance where said aspects of financial performance are selected from the group consisting of revenue, expense, capital change, cash flow, real option value, future market value, market sentiment value, market value and combinations thereof.

39. The method of claim 36 wherein a series of multivariate analyses are selected from the group consisting of identifying one or more previously unknown item performance indicators, discovering one or more previously unknown value drivers, identifying one or more previously unknown relationships between one or more value drivers, identifying one or more previously

unknown relationships between one or more elements of value, quantifying one or more inter-relationships between value drivers, quantifying one or more impacts between elements of value, developing one or more composite variables, developing one or more vectors, developing one or more causal element impact summaries, identifying a best fit combination of a predictive model algorithm and one or more element of value impact summaries for modeling enterprise market value and each of the components of value, determining a net element impact for each category of value, determining a relative strength of the elements of value between two or more enterprises, developing one or more real option discount rates, calculating one or more real option values, calculating an enterprise market sentiment value by element and combinations thereof.

40. The method of claim 39 wherein a predictive model algorithm is selected by a tournament from the group consisting of neural network; classification and regression tree; generalized autoregressive conditional heteroskedasticity, regression; generalized additive; redundant regression network; rough-set analysis; Bayesian; multivariate adaptive regression spline and support vector method.

41. The method of claim 36 wherein enterprise transaction data are obtained from systems selected from the group consisting of advanced financial systems, basic financial systems, alliance management systems, brand management systems, customer relationship management systems, channel management systems, estimating systems, intellectual property management systems, process management systems, supply chain management systems, vendor management systems, operation management systems, sales management systems, human resource systems, accounts receivable systems, accounts payable systems, capital asset systems, inventory systems, invoicing systems, payroll systems, purchasing systems, web site systems, the Internet, external databases and combinations thereof.

42. The method of claim 36 wherein the method further comprises using one or more composite applications to complete the processing.

43. The method of claim 36 wherein a model of enterprise market value further comprises a combination of component and category of value models selected from the group consisting of up to three predictive component of value models, a real option discount rate model, a real

option valuation model, a market sentiment model by element of value and combinations thereof.

44. The method of claim 36 where preparing transaction data for use in processing further comprises integrating said data in accordance with a common schema where the common schema is defined by a CORBA metadata or an xml metadata.

45. The method of claim 36 that further comprises identifying one or more value driver changes that will optimize a future market value portion of said enterprise market value.

46. A program storage device readable by machine, tangibly embodying a program of instructions executable by a machine to perform method steps for performing an element method, the method steps comprising:

integrating enterprise transaction data in accordance with a common model or schema,

analyzing at least a portion of the data using a neural network predictive model to identify one or more indicators of value for each element of value by category of value where the categories of value are current operation and categories of value selected from the group consisting of current operation, real option, market sentiment and combinations thereof,

determining a net tangible, relative contribution for each element of value to each category of value by modeling enterprise financial performance with said indicators by category and element of value,

calculating a value for each element of value using said contributions, and

reporting the element values using an electronic display or a paper document.

47. The program storage device of claim 46 where elements of value are selected from the group consisting of alliances, brands, channels, customers, customer relationships, employees, intellectual property, partnerships, processes, production equipment, vendors and vendor relationships, and combinations thereof.

48. The program storage device of claim 46 where a net relative contribution for each of one or more elements of value to each of one or more categories of value further comprises a direct element contribution to a category of value net of any element impacts on other elements of value.

49. The program storage device of claim 46 where determining a net relative contributions for each of one or more elements of value to a real option category further comprises:

computing the difference between the real option value calculated using the company cost of capital and the value calculated using a real option discount rate determined on the basis of relative element strength; and

assigning the value difference to the different elements of value based on their relative contribution to the difference in the two discount rates.

50. The program storage device of claim 46 where the net element contributions are identified by learning from the data where learning from the data is supported by genetic algorithms.

51. The program storage device of claim 46 where a common model or schema is defined by an xml metadata.

52. The program storage device of claim 46 where modeling enterprise financial performance further comprises:

identifying one or more value drivers for each element of value from the previously identified indicators,

developing one or more element impact summaries from said value drivers for market value and each component of value,

identifying a best fit combination of element impact summaries and predictive model algorithm for modeling market value and each component of value,

determining a relative strength for each of the elements of value causal to market value change vis a vis competitors,

calculating a real option discount rate using the relative element strength information for the elements that support the real option,

calculating a real option value and identifying a contribution to real option value by element of value using said real option discount rate, and

identifying a net element contribution to enterprise market value by category of value by combining the results from the prior processing.

53. The program storage device of claim 46 where the calculated value for each element of value further comprises a value for a point in time within a sequential series of points in time.

54. The program storage device of claim 46 wherein the net relative contribution for each element of value to each category of value further comprises a net causal contribution.

55. A future market value method, comprising:

integrating enterprise related data in accordance with a common model or schema,

developing a causal model of net element of value contribution to enterprise market value by category of value using at least a portion of said data, and

identifying one or more element of value related changes that will optimize a future market value portion of enterprise market value by analyzing said model

where the elements of value are selected from the group consisting of alliances, brands, channels, customers, customer relationships, employees, intellectual property, partnerships, processes, vendors and vendor relationships and combinations thereof.

56. The method of claim 55 where a common model or schema is defined by metadata.

57. The method of claim 55 that is enabled by the use of a flexible system architecture where said architecture further comprises event data that has been integrated in accordance with a common xml schema and independent components of application software that can be combined to process said data as required to produce useful results.

58. The method of claim 55 where a net contribution for each of one or more elements of value to each of one or more categories of value further comprises a direct element contribution to a category of value net of any element impacts on other elements of value within said category of value.

59. The method of claim 55 where a causal model of net element contribution further comprises a plurality of models selected from the group consisting of predictive component of value models, predictive market value models, relative element strength models, real option discount rate models, real option valuation models, market sentiment models and combinations thereof.

60. The method of claim 55 where a net contribution for each of one or more elements of value further comprises a direct contribution to a value of a category of value net of any impact on other elements of value.

61. The method of claim 55 where the one or more categories of value are selected from the group consisting of current operation, real option, market sentiment and combinations thereof.

62. The method of claim 55 where the future market value portion of enterprise market value further comprises a summation of values selected from the group consisting of the real option value, the portion of current operation value caused by elements of value, the portion of market sentiment value caused by elements of value and combinations thereof.

63. The method of claim 55 where the value driver changes that will optimize future market value are identified by algorithms selected from the group consisting of monte carlo algorithms, genetic algorithms, multi criteria optimization algorithms and combinations thereof.

64. A composite application method for data processing, comprising:
using two or more independent components of application software to produce one or more useful results by processing data where said data has been aggregated from two or more systems in accordance with a common model or schema defined by an xml metadata standard.

65. The method of claim 64 where the independent components of application software can be flexibly combined as required to support the development of one or more useful results.

66. (cancelled without prejudice)

67. The method of claim 64 where the independent components of application software complete processing selected from the group consisting of: analysis, attribute derivation, capitalization, causal analysis, classification, clustering, count linkages, data acquisition, data conversion, data storage, data transformation, element life estimation, indicator selection, induction, keyword counting, keyword match identification, locate linkages, relative strength determination, statistical learning, valuation, vector generation and combinations thereof.

68. The method of claim 64 that produces useful results selected from the group consisting of: element contribution determination, element impact quantification, element valuation, enterprise financial performance analysis, enterprise financial performance optimization, enterprise financial performance simulation, future market value optimization, future market value quantification, management reporting, real option discount rate calculation, real option valuation,

share price valuation, sub-element clustering, target share price determination and combinations thereof.

69. The method of claim 64 where enterprise management systems are selected from the group consisting of accounts receivable systems, accounts payable systems, advanced financial systems, basic financial systems, alliance management systems, brand management systems, customer relationship management systems, channel management systems, estimating systems, intellectual property management systems, process management systems, supply chain management systems, vendor management systems, operation management systems, sales management systems, human resource systems, capital asset systems, inventory systems, invoicing systems, payroll systems, purchasing systems, web site management systems, the Internet, external databases and combinations thereof.

70. A data processing method, comprising:

Integrating, converting and storing enterprise related transaction data in accordance with a common xml schema to support organization processing

where a set of integration and conversion rules are established using a metadata and conversion rules window and saved in metadata mapping table,

where some data are pre-specified for integration and conversion,

where the common schema further comprises a network schema that is defined by an xml metadata,

where said integration is completed by one or more independent software components, and

where the integrated data is stored in one or more tables in an application database.

71. The data processing method of claim 71 where each of one or more tables in an application database further comprise one axis that is defined by one or more time periods that require data and another axis that is defined by one or more data categories selected from the group consisting of components of value, sub components of value, known value drivers, elements of value, non-relevant attributes and combinations thereof.

EVIDENCE APPENDIX

Pages 24 - 27	excerpt from reference first cited July 1, 2005
Pages 28 - 30	excerpt from reference first cited August 1, 2006
Page 31	excerpt from reference first received October 7, 2006

US006073115A

United States Patent [19]

Marshall

[11] **Patent Number: 6,073,115**

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[54] **VIRTUAL REALITY GENERATOR FOR DISPLAYING ABSTRACT INFORMATION**

[76] Inventor: **Paul Steven Marshall**, 25 Fifth Ave, Apt. 6F, New York, N.Y. 10003

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[52] **U.S. Cl.** **705/35**; 705/2; 345/419

[58] **Field of Search** 705/34, 36, 37, 705/38, 39, 7, 8, 2; 345/419, 8; 702/150, 152, 153; 348/51; 382/154, 285

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,829,838	8/1974	Lewis et al.	345/419
4,934,773	6/1990	Becker	359/214
4,952,922	8/1990	Griffin et al.	345/421
5,021,976	6/1991	Wexelblat et al.	345/356
5,041,992	8/1991	Cunningham et al.	345/435
5,109,475	4/1992	Kosaka et al.	706/19
5,130,794	7/1992	Ritchey	348/29
5,555,354	9/1996	Strasnich et al.	345/427

OTHER PUBLICATIONS

H. Rheingold, Virtual Reality, 1991, pp. 154–174, pp. 367–371.

A. Pollack, "Coming Soon: Data You Can Look Under and Walk Through", New York Times, Oct. 14, 1990, p. F9.

IBM Corporation, IBM AIX Visualization Data Explorer/6000, Visualize the Future . . . Today, Jul. 1991.

Precision Visuals, Inc., Visual Data Analysis Software, Command Language, 1992.

Rohrbough, Linda; "Cyberarts: Lanier of VP: on 'voomies', & VR future", Newsbytes; Nov. 18, 1991.

Jacobson, Linda; "Virtual Reality: a status report"; A1 Expert; Aug. 1991, vol. 6, No. 8, p. 26.

Hindus, Len; "Virtual reality offers growing opportunity—for risk takers", EDN vol. v35, n 10A, p. 51, May 3, 1990.

Saffo, Paul; "Virtual reality is almost real"; Personnal Computer; vol. 14, No. 6, p. 99; Jun. 19, 1990.

J.D. Foley, et al.; "Fundamentals of Interactive Computer Graphics", pp. 6 and 539, Addison Wesley Publishing Co., 1984.

"Virtual Reality on the Trading Desk", pp. 14–18, vol. 9, No. 6, Wall Street & Technology, Feb. 1992.

"Cyberspace meets Wall Street", pp. 164–168, Forbes, Jun. 22, 1992.

"Workspace Displays", European Patent Application 91301798.4, published Sep. 18, 1991.

"The Information Visualizer, and Information Workspace", pp. 181–188, Reaching Through Technology, ACM's Chicago 1991 Conference Proceedings.

"The Illustrated Science and Invention Encyclopedia", pp. 2372–2373, Copyright 1983, H.S. Stuttman Inc.

"PV–Wave Point & Click", brochure, Precision Visuals, Inc., 1991.

"PV–Wave For Financial Applications", brochure, Precision Visuals, Inc., 1991.

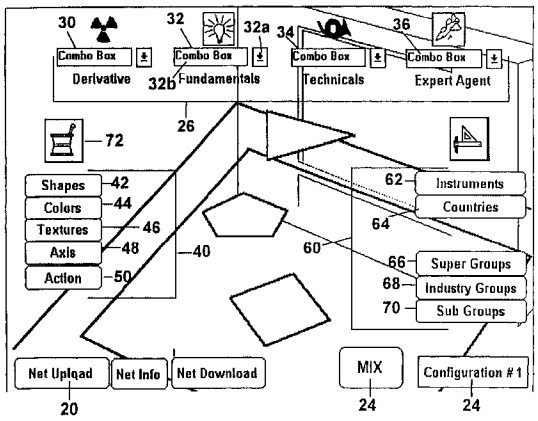
(List continued on next page.)

Primary Examiner—Stephen R. Tacs
Assistant Examiner—Alexander Kalinowski
Attorney, Agent, or Firm—Davidson, Davidson & Kappel, LLC

[57] **ABSTRACT**

A virtual reality generator having an input module that receives as input financial information is disclosed. The virtual reality generator outputs to a display device a virtual reality world generated from the financial information. The financial information can be pre-processed by a financial analytic system prior to input to the virtual reality generator. The financial information can be received from a data file. The virtual reality generator can dynamically display and continuously update the virtual reality world. Further, movement through the virtual reality world can be simulated.

45 Claims, 19 Drawing Sheets



data is able to be displayed at any one time and the trader is unable to see trends across wide segments and dimensions of data. Further, graphical representation are more likely than tabular representations to show patterns and irregularities, because humans are much better at pattern and scene recognition than at number processing and comparison. However, a two dimensional or a three dimensional graph is limited in the amount of information that can be, displayed and the amount of information a user can interact with.

Analytic programs now in use do not enable the user to view trends in large amounts of financial information in a superior graphical form while at the same time have the ability to view highly detailed data about specific items of this information. Current user interfaces and display techniques for large quantities of financial information are limited. A money manager is unable to "immerse" himself or herself into financial data representing many world markets and manipulate this data graphically. In particular, money managers and financial analysts currently can not use virtual reality techniques to analyze financial data.

It is known in the art to use virtual reality to model real world objects. For example, virtual reality has been used to create software applications that let architects "view" interiors of buildings and then enable a disabled person to "move" through the building to see if the design is satisfactory. Virtual reality has also been used to implement games that allow a user play-act within a virtual reality world, to enable a pilot to simulate flying an aircraft, to allow a surgeon to simulate a difficult operation and to allow a user to simulate visiting an art museum.

The use of virtual reality to allow a money manager or financial analyst (or other information professional) to view, manipulate, structure and travel through a three dimensional virtual reality world of financial information is not known. Nor is it known to use virtual reality techniques in combination with tools that carry out financial analysis, or to create artificial terrains where the boundaries of features of the terrain are related to the taxonomy of system that is being modelled.

SUMMARY OF THE INVENTION

The present invention uses virtual reality techniques to allow money managers and financial analysts to easily view otherwise unmanageable amounts of complex information and in particular, financial information about financial markets such as information about equities, commodities, currencies, derivatives and their related markets.

The virtual reality world created by the present invention does not map real world objects. Rather, the information displayed in virtual reality world created by the present invention is abstract information about the real world that does not have a physical object equivalent in the real world. The representative embodiment is directed to generating a virtual reality world from financial information, although in other embodiments, other abstract information, for example, sports results, legal information and defense information could be used to create the virtual reality world.

When abstract information, such as financial information, is displayed in a virtual reality world, it is represented by real world objects in three dimensional form, called metaphors. The present invention, in the representative embodiment, creates a three-dimensional virtual reality world of financial information. The virtual reality world presents specific financial information as three dimensional objects, or metaphors, as part of the virtual reality world. The user is able to view, manipulate, and travel through the metaphors, which are displayed in such a way to allow the user to easily locate relevant financial information, interact with different characteristics and see financial trends.

Further, the user is able to use the virtual reality world generated by the present invention to funnel information and trends from various sources into one object of the virtual reality world.

In effect, a virtual reality world created using financial information can be considered as displaying a hybrid of financial information and market geography representing a virtual financial world having terrain categorized and structured to enable a user to easily extract patterns and interconnections. Thus, for example, the geography of the virtual reality world (in the representative embodiment, it is market geography), is defined, in part, by a three dimensional coordinate system that sets out the borders of "geographical" features in the terrain. The geography can represent information elements that are non-integer taxonomies of the financial information. Thus, the present invention can map many characteristics of the system being modelled to a representative geography of the system where its taxonomy comes to life as a terrain.

If structured correctly, a virtual reality world has the advantage of presenting a very large amount of information in pictorial form. People can comprehend interactions and interrelationships between information when it is presented visually. Thus, an experienced virtual reality user can easily see, comprehend and remember complex interrelationships between items of information and, using visual cues, take advantage of the natural perceptual process of the human mind that processes visual information. This is particularly important for money managers and financial analysts who daily use large volumes of financial information from variety of sources.

The present invention, in a representative embodiment, comprises four modules. An input module continuously receives a stream of financial information. In the representative embodiment, this stream comprises real-time data about financial markets and is pre-processed by a financial analytic system. The second module, a user interface module, allows the user to input criteria to select certain parts of the stream of financial data for display and to input display settings for the virtual reality world and metaphors in the virtual reality world. In effect, the user interface module allows the user to define his or her virtual reality worlds. The third module, a filter module, selects the parts of the stream of financial dana for display in the virtual reality world based upon the criteria input by the user. The fourth module is a virtual reality generator that generates and continuously modifies the virtual reality world representing the financial data. The virtual reality generator allows the user to "travel through" the virtual reality world and to select metaphors in the virtual reality world for detailed display.

The input module in the representative embodiment takes as input information structured by an analytic system. (In alternative embodiments, the input can be received from a knowledge base, neural network, artificial intelligence system or any system that structures or categorizes data.) An analytic system organizes and structures raw financial information into various forms commonly used by money managers and financial analysts. In the representative embodiment, the analytic system that produces the preprocessed stream of financial information is the CAPRI financial analysis system, produced by Maxus Systems International of New York, N.Y. The CAPRI analytic system

itself receives as input real-time, financial data from on-line services such as the Reuters' and the Knight-Ridder Inc.'s digital data feed servers. The CAPRI analytic system takes this information (in the form of "raw" financial data), and using financial models and analysis techniques, builds a database of financial information. Systems such as the CAPRI analytic system are also able to store financial information for later analysis. (The CAPRI analytic system can display the financial data in standard spreadsheet-like windows operating in a Microsoft Windows environment. It also allows a user to export information to other application programs, a feature used by the input module of the present invention.) For example, the CAPRI analytic system allows a user to define areas of interest from large areas of financial information, and then create price and volume charts for any stock issue, including futures, stocks, indexes, currencies, bonds and commodities. The CAPRI analytic system, for example, can provide a graphical profit and loss and risk evaluation analysis for options strategies, create price volume charts including intra day charts with real time updating, create options strategies that can be saved for future analysis, undertake time, bond and futures analysis, and analyze and screen financial data (and generate reports) using techniques such as moving averages, momentum, Wilder's relative strength, stochastics and ordinary least squares. In the representative embodiment, the CAPRI analytic system is used to feed in real-time complex and voluminous financial information to the input module. In short, the more functions that the analytic system performs, the more functions that can be mapped to a virtual reality world.

The input module, in other embodiments, can be designed with simple modifications to receive input from rule-based expert systems (such as the Level5 Object program), neural networks that learn (such as the BRAINCEL neural network add-in for the EXCEL brand spreadsheet program by the Microsoft Corporation), knowledge bases that use fuzzy logic and the like. It is preferred if these input sources are DDE or OLE compatible, as explained below, to enable easy interaction and sharing of information.

The analytic system, as described above, requires a real time data feed. Alternatively, financial data can be entered manually into the analytic system or can be imported in batches and stored in the analytic system. In such cases, the analytic system would not operate in real time and therefore the virtual reality generator would not operate in real-time.

The analytic system that passes data to input module in the representative embodiment must be able to export financial data. For example, the CAPRI analytic system is able to export financial data to the Microsoft Excel spreadsheet program via the dynamic data exchange ("DDE") protocol in real-time. The DDE protocol is used by the input module of the representative embodiment to receive a stream of financial information. (In the representative embodiment, the input module, the user interface module and the filter module are all DDE and OLE compatible.) The financial data received by the input module can be that selected for display by the user using the user interface module, which interacts with the input module to request (using DDE protocol commands) selected financial data. In an alternative embodiment, the input module can be coupled directly to the financial data feed, such as the Reuter's data feed. In such an embodiment, the input generator requires a sub-module to interpret the data feed into a form recognized by the virtual reality generator. In another embodiment, the virtual reality generator can store, in an associated database, the financial information that is required to create the virtual reality world. In such circumstances, the virtual reality generator does not operate in real time. In a further embodiment, the input module of the present invention can be coupled to an application program, such as a spreadsheet program or a database program, and access financial information that is stored in such a program. The input module would therefore communicate with the application program using a protocol recognized by the application program.

The virtual reality generator of the present invention generates a virtual reality world from the inputed financial information. The virtual reality world represents the financial information. In the representative embodiment, the virtual reality world is constantly changing to represent changes in the financial information. For example, if the financial information concerns the futures market, the virtual reality world could represent the current state of the futures market.

The following is an example of a virtual reality world that can be generated by the virtual reality generator of the present invention. The virtual reality world is defined by the use of the user interface module. Assume that the user has selected as the virtual reality world the stock markets of Tokyo and New York. The user may designate that the three-dimensional virtual reality world be divided into a grid comprising four squares. One of the axis of the grid will represent the two stock markets, the other axis will represent two industry groups, such as "financial" and "industrials". Therefore, one square on the grid represents, for example, New York Industrials. Each square on the grid can be further divided to represent industry sub-groups for that market. Each stock is represented by a metaphor, for example, a polygon. The numbers of sides of the polygon can be selected by the user to represent, for example, the degree of capitalization of the stock. The color of the polygon can represent, for example, profit or loss. The height of the polygon (above or below the plane) can represent, for example, the price change or volatility of the stock. Polygons representing companies that are about to declare a dividend can be made to spin. Companies in bankruptcy can be represented by a flashing polygon. Each company's corporate logo can be textured on the top or side of the polygon. Visual arrow vectors, whose dimensions represent information about financial movement, can be coupled to a polygon to represent trends. Polygons that spin or blink can represent the results of the best 50 stocks selected by a certain criteria from a database. Other visual ques can be used to represent financial information about the stocks, as selected by the user.

The shapes, colors, positions, animations and textures of the metaphors can be selected by the user to represent different characteristics of the financial data.

Several incoming data streams can be the source of the financial information for one virtual reality world. (The sources can be combined by the analytic system or by the input module. In the representative embodiment, the sources are combined by the CAPRI analytic system.) As the financial data changes, the position, shape, color and texture of the metaphors in the virtual reality world also change.

The virtual reality world created by the virtual reality generator of the present invention allows the user to "fly" through a virtual world representing financial information. As another example, assume that the virtual reality world designed by the user concerns one stock market arranged by industry groups and sub-groups. The user can position himself or herself in the virtual reality world so that the user has a bird's eye view of the stock market. In the example, the

the representative embodiment, the display parameters in the display parameter section **40** are set by activating the appropriate labeled button, causing a further interface card to be displayed which allows the user to set the various parameters.

Additionally, in a representative embodiment, an action parameter **50** allows the user to specify what input stream is to be used as input to the input module **8** for processing by the virtual reality generator **4** and what parts of the information from that input stream are of interest to the user. For example, in the representative embodiment, the user will specify that the input stream is the output of the CAPRI analytic system and can then specify what sub-set of the possible information that can be generated by the CAPRI analytic system is to be displayed. (In the representative embodiment, the user's selections are translated by the user interface module into a form that the CAPRI analytic system can understand. The CAPRI analytic system will then output to the input module **8** of the present invention only that information that satisfies the defined queries. For example, the user's selections are translated into the form as specified in the CAPRI manual, Chapter 19. In particular, the queries sent to the CAPRI analytic system conform with the DDE protocol and are of the form set out in Chapter 19.4 of the CAPRI manual. Alternatively, the input module **8** can receive packets of information, for example, in a form illustrated in FIGS. **4***a*–**4***c*. The input module **8** screens this information based upon the display parameters and filters that were set by the user.

In other embodiments, as discussed above, a data base containing financial information can be used in place of the analytic engine. For example, financial information can be stored in a application program data base. In such a case, the query generated by the virtual reality generator must be in a form understood by the database application program. Therefore, the action parameter **50** is used to specify what file or application program is to be the source of the financial data input and sets actions to take place on that file or by that application program to screen the information that is input.

In particular, the action parameter **50**, in the representative embodiment, is a button that, when activated, causes the interface card of FIG. **10** to be displayed. This interface card enables the user to set and define available actions for each analytic type. These actions can be linked to an action indicator **26**.

An axis display parameter **48** allows the user to set the Z-axis (sometimes called the vertical axis) of the three dimensional virtual reality world. (The X-axis and Y-axis are set as discussed below with reference to FIG. **11**.) Generally, the three axes can represent any category of financial information. For example, one axis can be set to represent countries, a second axis can be set to represent industry groups and a third axis can be set to represent price changes. Alternatively, the user could set the first axis to define two stock markets, for example New York and Tokyo, the second axis to represent two types of stocks, for example utilities and financial, and the third axis to represent percentage change in value of the stock over any user defined time period. Alternatively, the user could set the first axis to represent industry groups in a country, the second axis to represent option maturity dates and the third axis to represent price or volatility.

In the representative embodiment, the Z-axis is set using the axis display parameter **48**. Examples of common settings for the Z-axis include an issues' percentage change over any user defined time period, today's price of an issue relative to a moving average over any user defined time period, the price of an issue relative to an average of the high/low price over any user defined time period and the price of an issue relative to any broad market index over any user defined time period.

The user has total flexibility to set the virtual reality world display parameters **40** so that the virtual reality world generated by the virtual reality generator **4** of the present invention is a representation of the financial information which interests the user. For example, the shape display parameter **42** can be set to represent three degrees of any financial information that the user desires. The interface cards of the representative embodiments illustrated are a convenient way to allow a user to specify the makeup and composition of a virtual reality world, using financial categories commonly used by money managers. The user interface module **2** of the present invention can be designed to suit the needs of each user and display interface cards and have various filters that allow the virtual reality world to be created with great flexibility. Accordingly, the interface cards discussed are for illustration only and are not intended to limit the broad concepts and uses for the virtual reality world of the present invention.

The fifth section of the window generated by the user interface module is a filter section **60**. In the representative embodiment, the filter section allows the user to set parameters so that a filter module or the input module **8** can select the parts of the stream of financial data **14** for display. The parts of the financial data which are displayed in the virtual reality world depends upon the criteria input by the user in the filter section **60** of the window generated by the user interface module **2**.

In the representative embodiment, there are five filters that can the set using the filter section of the window generated by the user interface module, namely, an instruments filter **62**, a countries filter **64**, a super-group filter **66**, an industry group filter **68** and a sub-group filter **70**.

The instruments filter **62** allows the user to select any combination of financial instruments for display in the virtual reality world (see FIG. **6**). All possible instruments can be displayed, including stocks, options, futures, commodities, financial indexes, foreign exchange, bonds, and mutual funds. For example, if the user was only interested in stocks and bonds, the user could select, using the instrument filter **62**, stocks and bonds so that the virtual reality world comprises financial information concerning stocks and bonds, and no other instruments.

The countries filter **64** allows the user to specify countries. The financial information displayed in the virtual reality world will be that related to the specified countries. Also displayed are the country's exchanges to which the user is able to access.

The super-group, industry group and sub-group filters (**66**, **68**, **70**) allow the user to specify and define groups of financial information about types of industries. For example, the super-group filter **66** can be used to filter for display information about any combination of industries, such as utilities, financial, industrials and the like. Using the industry group filter **68**, the user can select specific industrial groups such as computers, construction, auto, and the like. Using the sub-group filter **70**, the user can select for display particular sub-groups of industry groups, such as information about auto manufacturers that make light trucks.

The five filters described above are examples of the types of filters that can be used to select for display areas of financial information. The user interface module **2** uses the

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Krishnaswamy et al.

(10) **Patent No.: US 6,909,708 B1**
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(54) **SYSTEM, METHOD AND ARTICLE OF MANUFACTURE FOR A COMMUNICATION SYSTEM ARCHITECTURE INCLUDING VIDEO CONFERENCING**

(75) Inventors: **Sridhar Krishnaswamy**, Cedar Rapids, IA (US); **Isaac K. Elliott**, Colorado Springs, CO (US); **Tim E. Reynolds**, Iowa City, IA (US); **Glen A. Forgy**, Iowa City, IA (US); **Erin M. Solbrig**, Cedar Rapids, IA (US)

(73) Assignee: **MCI Communications Corporation**, Washington, DC (US)

(*) Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 148 days.

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(52) **U.S. Cl.** **370/352**; 370/389; 370/392; 379/90.01; 379/93.07; 379/114

(58) **Field of Search** 370/352, 383, 370/389, 390, 392, 401, 402, 256, 410, 408; 379/67, 89, 93.07, 93.08, 93.25, 100.11, 114, 201, 207, 100.13, 93.14, 93.29, 93.01, 90.01; 455/436

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,100,377 A 7/1978 Flanagan 179/15
4,464,543 A 8/1984 Kline et al.
4,771,425 A 9/1988 Baran et al. 370/85

(Continued)

OTHER PUBLICATIONS

Macedonia, M.R. and Brutzman, D.P., "MBone Provides Audio and Video Across the Internet", IEEE Computer, pp. 30–36, Apr. 1994.*

Kumar, V., "Internet Multicasting: Internet's Next Big Thing", ICAST White Paper, pp. 1–11, Jan. 1996.*

Schulzrinne, H. et al., "RFC 1889—RTP: A Transport Protocol for Real–Time Applications", Jan. 1996.*

Schulzrinne, H. et al., "RFC 1890—RTP Profile for Audio and Video Conferences with Minimal Control", Jan. 1996.*

Eriksson, H., "MBONE: The Multicast Backbone", Communications of the ACM, vol. 37, No. 8, pp. 54–60, Aug. 1994.*

Sullivan, K.B., "Videoconferencing Arrives on the Internet", PC Week (Aug. 22, 1996), Aug. 1996.*

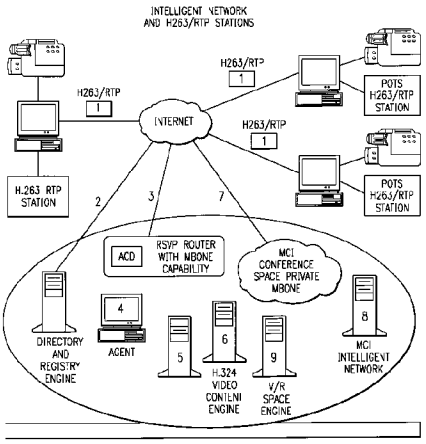
(Continued)

Primary Examiner—Alit Patet

(57) **ABSTRACT**

Telephone calls, data and other multimedia information including video, audio and data is routed through a switched network which includes transfer of information across the internet. Users can participate in video conference calls in which each participant can simultaneously view the video from each other participant and hear the mixed audio from all participants. Users can also share data and documents with other video conference participants. Users can manage more aspects of a network than previously possible, and control network activities from a central site.

20 Claims, 135 Drawing Sheets



During service **2200** execution, profile data is used to determine the behavior of service features **2202**. Depending on service performance requirements, some or all of the profile data needed by a service may be cached on a service engine **2134** from the ISP **2100** database server **2182** to prevent expensive remote database lookups. As the service executes, information may generated by service features **2202** and deposited into the Context Database. This information is uniquely identified by a network transaction identifier. In the case of a circuit-switched call, the already-defined Network Call Identifier will be used as the transaction identifier. Additional information may be generated by network equipment and deposited into the Context Database as well, also indexed by the same unique transaction identifier. The final network element involved with the transaction deposits some end-of-transaction information into the Context Database. A linked list strategy is used for determining when all information has been deposited into the Context Database for a particular transaction. Once all information has arrived, an event is generated to any service which has subscribed to this kind of event, and services may then operate on the data in the Context Database. Such operations may include extracting the data from the Context Database and delivering it to billing systems or fraud analysis systems.

6. Service Interactions

In the course of a network transaction, more than one service can be invoked by the network. Sometimes, the instructions of one service may conflict with the instructions of another service. Here's an example of such a conflict: a VNET caller has a service which does not allow the caller to place international calls. The VNET caller dials the number of another VNET user who has a service which allows international dialing, and the called VNET user places an international call, then bridges the first caller with the international call. The original user was able to place an international call through a third party, in defiance of his company's intention to prevent the user from dialing internationally. In such circumstances, it may be necessary to allow the two services to interact with each other to determine if operation of bridging an international call should be allowed.

The ISP service model must enable services **2200** to interact with other services. There are several ways in which a service **2200** must be able to interact with other services (see FIG. **26**):

Transfer of Control **2210**: where a service has completed its execution path and transfers control to another service;

Synchronous Interaction **2212**: where a service invokes another service and waits for a reply;

Asynchronous Interaction **2214**: where a service invokes another service, performs some other actions, then waits for the other service to complete and reply; or

One Way Interaction **2216**: where a service invokes another service but does not wait for a reply.

In the example of interacting VNET services above, the terminating VNET service could have queried the originating VNET service using the synchronous service interaction capability. The interesting twist to this idea is that service logic can be deployed onto both network-based platforms and onto customer premises equipment. This means that service interaction must take place between network-based services and customer-based services.

7. Service Monitoring

Services **2200** must be monitored from both the customer's viewpoint and the network viewpoint. Monitoring follows one of two forms:

The service **2200** can generate detailed event-by-event information for delivery to the transaction context database

The service can generate statistical information for delivery periodically to a statistics database, or for retrieval on demand by a statistics database.

Analysis services can use the Statistics Database or the Context Database to perform real time or near real time data analysis services.

The Context Database collects all event information regarding a network transaction. This information will constitute all information necessary for network troubleshooting, billing, or network monitoring.

I. ISP Data Management Model

This section describes the Data Management **2138** aspects of the Intelligent Services Platform (ISP) **2100** Target Architecture.

1. Scope

The ISP Data Management **2138** Architecture is intended to establish a model which covers the creation, maintenance, and use of data in the production environment of the ISP **2100**, including all transfers of information across the ISP boundaries.

The Data Management **2138** Architecture covers all persistent data, any copies or flows of such data within the ISP, and all flows of data across the ISP boundaries. This model defines the roles for data access, data partitioning, data security, data integrity, data manipulation, plus database administration. It also outlines management policies when appropriate.

2. Purpose

The objectives of this architecture are to:

Create a common ISP functional model for managing data;

Separate data from applications;

Establish patterns for the design of data systems;

Provide rules for systems deployment;

Guide future technology selections; and

Reduce redundant developments and redundant data storage.

Additional goals of the target architecture are:

Ensure data flexibility;

Facilitate data sharing;

Institute ISP-wide data control and integrity;

Establish data security and protection;

Enable data access and use;

Provide high data performance and reliability;

Implement data partitioning; and

Achieve operational simplicity.

3. Data management Overview

In one embodiment, the Data Management Architecture is a framework describing the various system components, how the systems interact, and the expected behaviors of each component. In this embodiment data is stored at many locations simultaneously, but a particular piece of data and all of its replicated copies are viewed logically as a single item. A key difference in this embodiment is that the user (or end-point) dictates what data is downloaded or stored locally.

a) Domains

Data and data access are characterized by two domains **2220** and **2222**, as shown in FIG. **27**. Each domain can have multiples copies of data within it. Together, the domains create a single logical global database which can span international boundaries. The key aspect to the domain definitions below is that all data access is the same. There is no difference in an Order Entry feed from a Call Processing lookup or Network side data update.

Central domain **2220** controls and protects the integrity of the system. This is only a logical portrayal, not a physical

entity. Satellite domain **2222** provides user access and update capabilities. This is only a logical portrayal, not a physical entity.

b) Partitions

In general, Data is stored at many locations simultaneously. A particular piece of data and all of its replicated copies are viewed logically as a single item. Any of these copies may be partitioned into physical subsets so that not all data items are necessarily at one site. However partitioning preserves the logical view of only one, single database.

c) Architecture

The architecture is that of distributed databases and distributed data access with the following functionality:

Replication and Synchronization;

Partitioning of Data Files;

Concurrency Controls;

Transactional Capability; and

Shared common Schemas.

FIG. **28** shows logical system components and high-level information flows. None of the components depicted is physical. Multiple instances of each occur in the architecture. The elements in FIG. **28** are:

NETWK **2224**—external access to the ISP **2100** from the network side;

SVC I/F **2226**—the network interface into ISP;

SYSTMS **2228**—external application such as Order Entry;

G/W **2230**—a gateway to the ISP **2100** for external applications;

dbAppl **2232**—a role requiring data access or update capabilities;

dbClient **2234**—the primary role of the satellite domain;

dbServer **2236**—the primary role of the central domain;

dbAdmin **2238**—an administrative role for Data;

dbMon **2240**—a monitoring role;

I/F Admin **2242** administrative role for interfaces; and

Ops **2244**—operations console.

d) Information Flow

The flows depicted in FIG. **28** are logical abstractions; they are intended to characterize the type of information passing between the logical components.

The flows shown above are:

Rest—data requests to the ISP from external systems;

Resp—responses from the ISP to external requests;

Access—data retrieval by applications within the ISP;

Updates—data updates from applications within ISP;

Evts, data related events sent to the monitor;

Meas—data related metrics sent to the monitor;

New Data—additions to ISP master data;

Changed Data changes to ISP master data;

Views—retrieving ISP master data;

Subscriptions—asynchronous stream of ISP master data;

Cache copies—a snapshot copy of ISP master data;

Actions—any control activity; and

Controls any control data.

e) Domain Associations

In general the Satellite domains **2222** of Data Management **2138** encompass:

ISP Applications;

External systems;

Network interfaces **2226** and system gateways **2230**; and

Database client (dbClient) **2234**.

The Central domain for Data Management **2138** encompasses:

Monitoring (dbmon) **2240**;

Administration (dbadmin) **2238**; and

Database masters (dbServer) **2236**

4. Logical Description

The behavior of each Architecture component is described separately below:

a) Data Applications (dbAppl) **2232**

This includes any ISP applications which require database access. Examples are the ISN NIDS servers, and the DAP Transaction Servers, The applications obtain their required data from the dbClient **2234** by attaching to the desired databases, and providing any required policy instructions. These applications also provide the database access on behalf of the external systems or network element such as Order Entry or Switch requested translations. Data applications support the following functionality:

Updates: allow an application to insert, update, or delete data in an ISP database.

Access requests allow an application to search for data, list multiple items, select items from a list or set, or iterate through members of a set.

Events and Measurements are special forms of updates which are directed to the monitoring function (dbMon) **2240**.

b) Data Management **2138**

(1) Client Databases (dbclient) **2234**

The dbClients represent satellite copies of data. This is the only way for an application to access ISP data. Satellite copies of data need not match the format of data as stored on the dbServer **2236**.

The dbClients register with master databases (dbServer) **2236** for Subscriptions or Cache Copies of data. Subscriptions are automatically maintained by dbServer **2236**, but Cache Copies must be refreshed when the version is out of date.

A critical aspect of dbClient **2234** is to ensure that data updates by applications are serialized and synchronized with the master copies held by dbServer **2236**. However, it is just as reasonable for the dbClient to accept the update and only later synchronize the changes with the dbServer (at which time exception notifications could be conveyed back to the originating application). The choice to update in lock-step, or not, is a matter of application policy not Data Management **2138**.

Only changes made to the dbServer master copies are forwarded to other dbClients.

If a dbClient **2234** becomes inactive or loses communications with the dbServer; it must resynchronize with the master. In severe cases, operator intervention may be required to reload an entire database or selected subsets.

The dbClient **2234** offers the following interface operations:

Attach by an authorized application to a specified set of data;

Policy preferences to be set by an authorized application;

Select a specified view of the local copy of data;

Insert, Update, or Delete of the local copy of data;

Synchronize subscripted data with the dbServer; and

Expiration notifications from dbServer for cached data.

Additionally, the dbClients submit Logs or Reports and signal problems to the monitor (dbMon) **2240**.

(2) Data Masters (dbServer) **2236**

The dbServers **2236** play a central role in the protection of data. This is where data is 'owned' and master copies maintained. At least two copies of master data are maintained for reliability. Additional master copies may be deployed to improve data performance.

These copies are synchronized in lock-step. That is each update is required to obtain a corresponding master-lock in order to prevent update conflicts. The strict implementation policies may vary, but in general, all master copies must preserve serial ordering of updates, and provide the same

DDE Basics

Dynamic Data Exchange (DDE) is a mechanism for two applications on the same computer to pass data back and forth. There are three basic components to a DDE conversation, the application, topic, and item(s). Some sources may call the topic and item(s) by different names, but it's the same thing. First, lets define each of these parts.

Application
That's typically the executable name (but not necessarily). For instance, when working with Excel, the application name is EXCEL and the executable name is EXCEL.EXE. When connecting to the Visual Automation Program Manager as a DDE Server, the application is VAPRGMAN and the executable name is VAPRGMAN.EXE.

Topic
There may be multiple topics in an application. Topics are a method of organizing the items that correlate with the functionality of a program. In Excel 4.0, a topic corresponds with an open sheet. If you have 4 spreadsheets open, you have a topic for each one and designated by the name of each open sheet. In Excel 5.0, several workbooks may be open with several sheets inside, each sheet is a topic designated by both the workbook and the sheet name. In the Visual Automation Program Manager, there is only one topic, named System.

Item
The item is actually the piece of data, or the first piece of data within a block of data. In Excel, the item is the cell that contains the data, denoted by row & column position such as R1C1. In the Visual Automation Program Manager, the items are as follows:

Drive	Memory
DriveAlarm	MemoryAlarm
DriveAlarmOn	MemoryAlarmOn

These represent the memory free, and disk space free with corresponding alarm threshold settings. The AlarmOn items are 0 if not in alarm and 1 if in alarm.

Clients and Servers
Just when you thought you were getting the hang of this, I had to throw the old client/server thing at you. Yeah, I know these are the two most used (and mis-used) terms thrown at us these days, but let's get through it. An application can be a DDE Server. It can be a DDE Client. It can be both a DDE Server and a DDE Client! A DDE Server serves data to DDE clients. A DDE Client requests data from a DDE Server. Excel is an example of both a client and a server. Excel can get data from DDE Servers and serve data to other DDE clients. The Visual Automation Program Manager is also a client and a server. It serves data as described above and can launch applications based on other DDE Servers as described in the startup application section.

An Example
Take a DDE Server, select some data, and select Copy or Copy to Clipboard from the edit menu. This places the "hot" data into the clipboard. Take a DDE Client, select Paste Link or Paste Special (and then Link), and a DDE Link should be created. By examining the syntax in your DDE Client, you should be able to create DDE Links without the clipboard. DDE Syntax is different in just about every single software package, so you should read through your help files about your particular application. Does the name Dynamic Data Exchange make more sense now? Dynamic data in the server is being moved to a client, via the Application, Topic, and Item.

Related Proceedings Appendix

None